

MARINE ALGAE OF INHACA ISLAND AND OF THE INHACA PENINSULA, II.

By

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(With Plates III—VI)

INTRODUCTION

The first paper of this series (Isaac, 1956) included general comments on the marine vegetation and ecological conditions of Inhaca Island and the Inhaca Peninsula. An outline map of the region was also included. For convenience the localities which are referred to in this paper are listed below.

Inhaca Peninsula (East Coast): Santa Maria, Ponta Abril.

Inhaca Island:

West Coast—Estação Biologia Maritima, Ponta Rasa, Ponta Punduini at the extreme southern end.

South Coast—Saco (or Saco da Inhaca).

East Coast—Lighthouse rocks (used to include Cabo Inhaca).

The systems of classification used are the same as in the first paper on Inhaca seaweeds and as in "Some Marine Algae from Xai-Xai" (Isaac, 1957) which is referred to in the text of this paper as "Xai-Xai Algae".

References to literature are dealt with in the same way as in the first Inhaca and Xai-Xai papers. This includes the enclosing within brackets of a reference which has not been seen and indicating such with an asterisk in the list at the end of the paper.

CHLOROPHYCEAE

CLADOPHORALES

Chaetomorpha crassa (Ag.) Kütz.

See "Xai-Xai Algae", p. 78.

Santa Maria.

Cladophora prolifera (Roth) Kütz.

Sub-nom *Conferva prolifera*.

(Roth: *Cat. Bot.*, 1, p. 182.)

Sub-nom *Cladophora prolifera*.

Kützing: *Phycologia Germanica*, p. 207.

Hamel: *Rev. Algologique*, vol. 1, p. 172.

Santa Maria, Lighthouse rocks.

Material B.280 and B.349 agrees with Hamel's description of *Cladophora prolifera*.

The plants examined were up to about 5 cm. in height and occur as dense greenish brown tufts which become brownish in colour on drying. The filaments are tightly packed to form a compact sheaf. The lower cells and cells of the main axes have an increasing diameter from the base upwards being thus clavate in form but the distal cells are more or less cylindrical. (Fig. 1. A, B). The lower cells produce decurrent rhizoids which knit filaments together (Fig. 1, C). Hamel describes the rhizoids as being annular in their lower halves and much branched at their tips. The lower cells are annulated in a similar manner to the rhizoids. In the Inhaca plants the annulations of the rhizoids and lower cells extend almost the full length of the cells (Fig. 1, A, C).

Annular constrictions are not mentioned in Kützing's original description of the species. Börgesen refers to similar material found in the Canary Islands as *C. prolifera* (Börgesen, 1925, p. 61). The rhizoids of Canary Island plants are described by Börgesen as being annular throughout their length.

The Inhaca material described here as *C. prolifera* differs from the taxon recorded from the Union of South Africa as *C. rugulosa* Martens (once known as *C. prolifera*) especially in that decurrent rhizoids are absent in the latter.

Thanks are due to Mr. R. H. Simons for identifying the Inhaca material as *Cladophora prolifera* and for drawing Fig. 1.

SIPHONALES**Boodleopsis pusilla** (Collins) Taylor.

Sub-nom

Dichotomosiphon pusillus (Collins: *Tufts Coll.*

Stud., vol. 2, p. 431).

Sub-nom

Boodleopsis pusilla. Taylor, Joly and.

Bernatowicz: *Mich. Acad. Sci., Arts, Letters*, vol. 38, p. 97.

Saco (Mangrove Swamp).

The identification of specimen B.354 as *Dichotomosiphon pusillus* or a

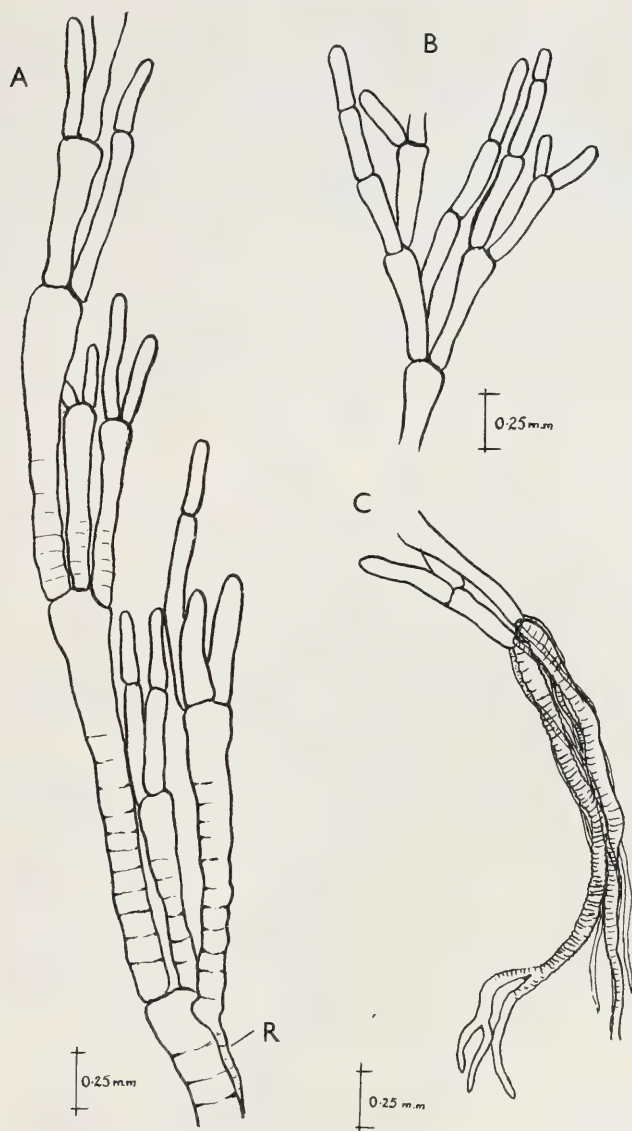


Fig. 1—*Cladophora prolifera* (Roth) Kütz.

- A. Cells of main axis. Lower cells showing annulations. R=Rhizoid.
- B. Cylindrical distal cells of branches.
- C. Rhizoids arising from lower cells. Note annulations on rhizoids.

closely related form was confirmed by Professor W. R. Taylor who transferred the genus *Dichotomosiphon* to *Boodleopsis* in 1953. Taylor sounds the cautionary warning that the material may be "protonemal stages of other, larger Codiaceae, and like moss protonemas may not be readily differentiated" (private communication). It is well to quote further from his letter: "As to the specimen, I see no reason to question that it is a *Dichotomosiphon* closely related to *pusillus*, if not identical. The diameter of the filaments seems a bit high: around $50\ \mu$ and the habit rather more compact, with more frequent akinetes than I have noted in natural-grown specimens in Bermuda. . . . Since you would not have the same species of Codiaceae at Inhaca Island as we would have at Bermuda, I have some hesitancy in swearing that the *Boodleopsis* specimens are identical. On the other hand, if they are not protonemas, I would have no hesitancy in calling yours, mine and Joly's Brazilian

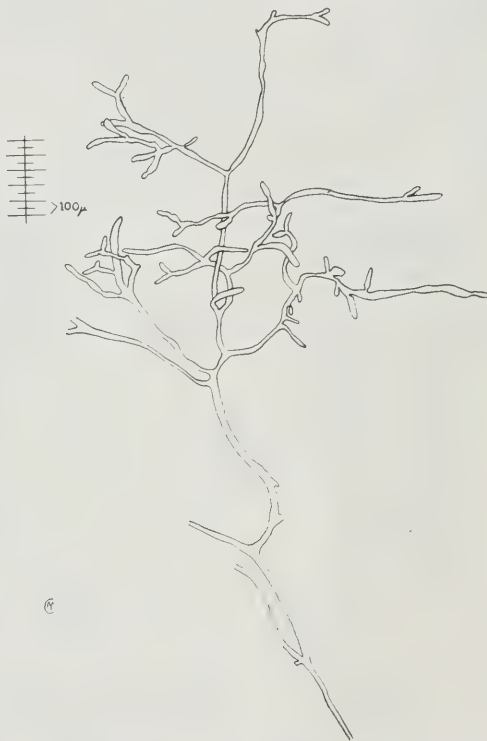


Fig. 2—*Boodleopsis pusilla* (Collins) Taylor. (B. 354.)

materials the same, simply slightly extending the range of the characters.” Details regarding identity, nomenclature and morphology of *Boodleopsis pusilla* are to be found in the paper by Taylor *et alia* (1953).

The morphology of the Inhaca material is illustrated in Figs. 2 and 3 which show the general dichotomous character of the branching, the coenocytic nature of the filaments and the presence of constrictions.

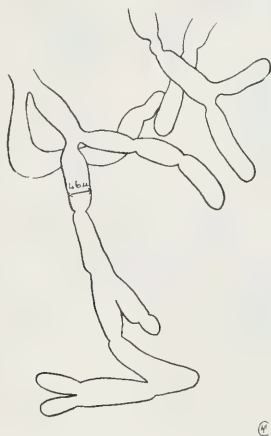


Fig. 3—Portion of *Boodleopsis pusilla* (Collins) Taylor (B. 354), showing branching and constrictions.

The specimens were collected in the Saco da Inhaca at the Southern end of the island where they grow on *Rhizophora* roots and on the fine black mud between mangrove trees. They are uncovered at low water and spread over the mud, in places forming a green network of moderate density.

In relation to the possibility of material B.354 being a protonemal stage of another larger member of the Codiaceae it may be remarked that such plants if they occur at all in the Saco must be rare or strictly seasonal. The only other siphonous Chlorophyceae at all common in this part of the island in July is *Acetabularia calyculus* (Isaac, 1956).

***Caulerpa ambigua* Okamura.**

(Okamura, *Bot. Mag. Tokyo*, vol. 11, p. 4).

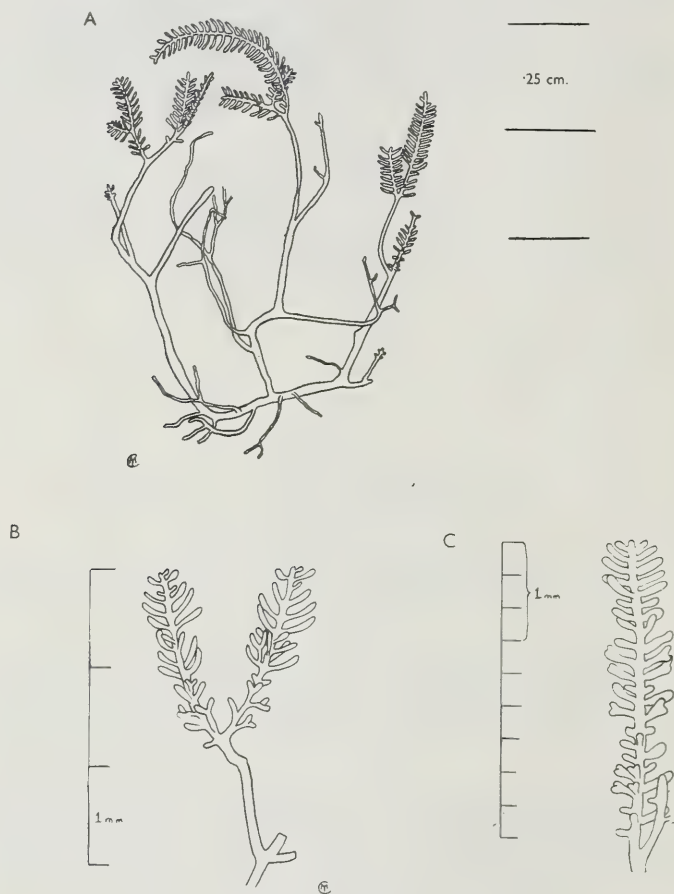
Okamura, *Icones of Japanese Algae*, vol. 3, p. 168, pl. 139.

Eubank, *Univ. Calif. Publ. Bot.*, vol. 18, No. 18, p. 410, Plate 22.

Sub-nom *Caulerpa vickersiae*.

(Börgeesen: *Bot. Tidsskr.*, vol. 31, p. 129, Fig. 2.)Börgeesen, *Mauritius Algae*, Additions (1949), p. 6.

Ponta Abril.

Fig. 4—*Caulerpa ambigua*. Okamura (B. 220A).

- A. General habit showing well developed prostrate system.
 B. Portion of B. 220A.
 C. Portion of B. 233A.

The Inhaca material of this species shows a well developed prostrate system (Fig. 4 A). The pinnae arise on the frond in a distichous manner although the arrangement is not quite regular (Fig. 4 B). On

some fronds a proportion of the pinnae show a limited apical bifurcation (Fig. 4, B and C), a feature seen in proximal rather than in distal pinnae. This species has been recorded from Mauritius under the name *Caulerpa vickersiae* Börg., by which name Börgesen maintains that the taxon should be known (Börgesen, 1949, P. 6; 1953, P. 6). The plants collected were small although falling within the size range for height given by Eubank (0.4—2 cms.).

This species was collected by Pocock and Papenfuss at Umhlali, about 30 miles north of Durban (Papenfuss, 1951).

***Caulerpa webbiana* Montagne.**

(Montagne: *Ann. Sci. Nat., Bot.*, vol. 9, p. 129).

Eubank, *Univ. Calif. Publ. Bot.*, vol. 18, p. 415, Fig. 1 and Plate 22.

Weber van Bosse: *Des Caulerpes*, p. 269, pl. 21, Figs. 1—4.

Ponta Abril, Lighthouse rocks.

The material examined (B.328) consists of small green spongy plants, resembling a very small *Codium* in general appearance. The fronds are up to 1.5 cms. high, mostly attaining a height of about 1 cm. The majority of fronds are erect, simple and densely covered with furcate, mucronate ramuli (Fig. 5). There are five or six ramuli per node. The prostrate rhizome, covered with sand particles, has numerous long branched rhizoids (Fig. 6) but is devoid of ramuli. The rhizome has a diameter of about 1 mm., the frond a diameter of 1—1.5 mm. while the ramuli are about 600 μ long.

Inhaca plants of *Caulerpa webbiana* differ from Eubank's description (1946, p. 415) in being somewhat smaller at their maximum size and in having 5 or 6 ramuli per node instead of 4 or 5. Weber van Bosse (1898) gives 3 to 6, generally 4, ramuli per node for f. *typica* with which forma the Inhaca plants best agree.

The possibility of this material being *Caulerpa pickeringii* Harvey and Bailey ($\equiv$ *C. webbiana* var. *pickeringii* (Harvey and Bailey) Eubank) was considered since the two taxa are similar but on the basis of Eubank's delimitation of the taxa (Eubank, 1946) and the examination of the material available at the British Museum (Natural History) it was concluded that B.328 was not *Caulerpa pickeringii* Harvey and Bailey. The latter species is a more robust plant, the rhizomatous part is covered with ramuli, and there are six to twelve ramuli per node. That B.328 is a less robust and smaller plant than the described specimens of *C. pickeringii* may not be significant but on the basis of our present knowledge of these forms the presence of a decidedly smaller number of ramuli per node and especially the absence of ramuli on the rhizomatous region must be regarded as significant characteristics.

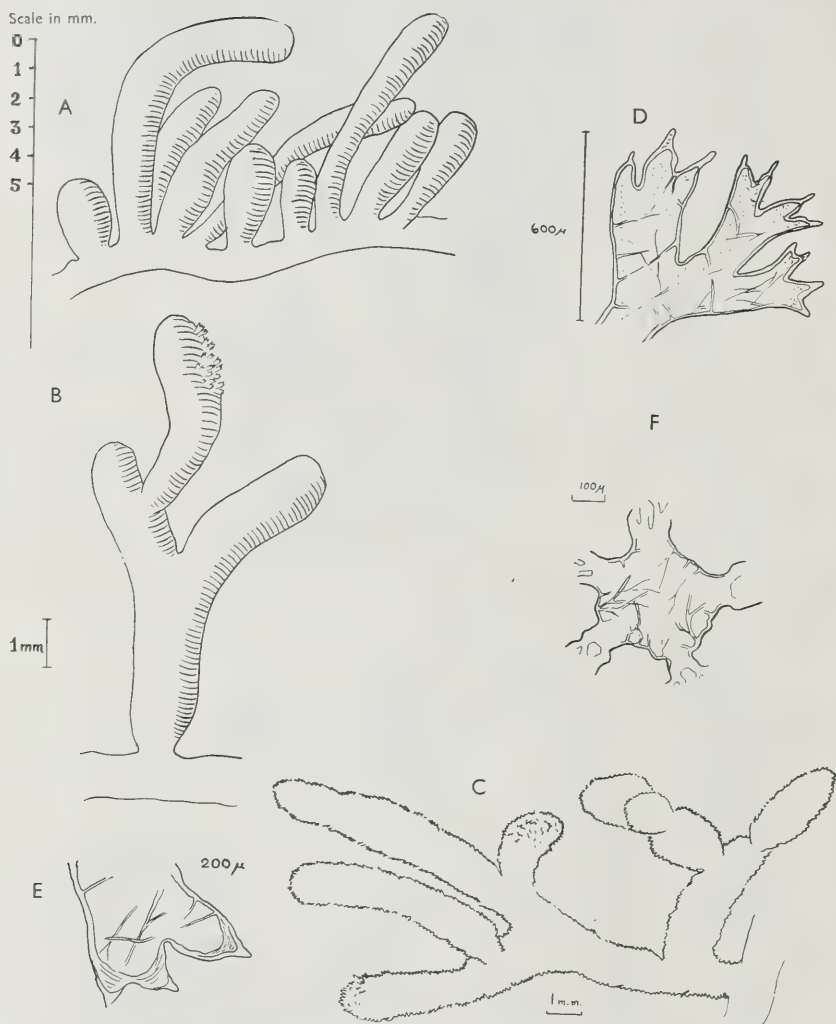


Fig. 5—*Caulerpa webbiana* Montagne. (B. 328.)

- A. Portion of Plant.
- B. Longest frond observed.
- C. Most branched frond observed.
- D. Distal portion of ramulus.
- E. Part of distal portion of ramulus.
- F. Transverse section of frond showing bases of ramuli.

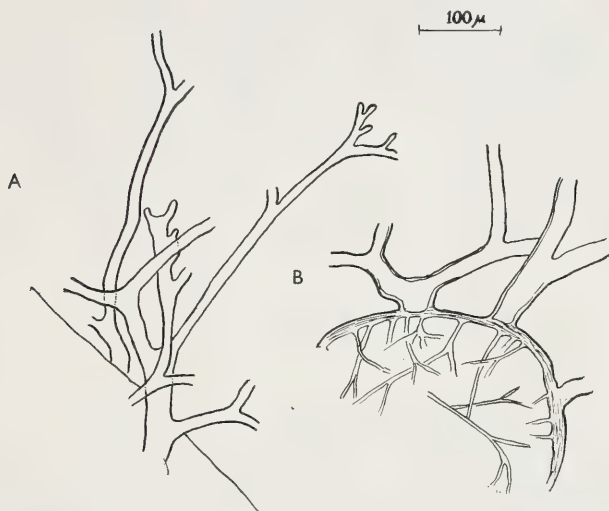


Fig. 6—*Caulerpa webbiana* Montagne (B. 328): rhizomatous prostrate part of plant.
 A. Surface view showing long, branched rhizoids.
 B. Transverse section with bases of rhizoids.
 Note absence of ramuli.

On returning to the British Museum one of the authors of this paper, Miss Yvonne Chamberlain, made the following comment on B.328. "We have only one specimen of *Caulerpa pickeringii* in the collection. It is from Tahiti and was identified by Setchell. It is a much larger and more robust looking plant than B.328 and the rhizomatous portion quite clearly has whorls of ramuli and looks just like one of the upright branches. . . . We have quite a number of specimens of *C. webbiana* and B.328 very closely resembles another one from Tahiti also identified by Setchell, which also lacks ramuli on the rhizomatous parts."

SIPHONOCLADALES

Anadyomene wrightii Gray.

Gray, J. E.: *Jour. Bot.*, vol. 4, p. 48, Pl. 44, Fig. 5.

Agardh, J.: *Till. Alg. Syst.*, Section 8, Siphoneae, p. 124.

Börjesen: *Mauritius Algae* 1, Chlorophyceae, p. 32.

Okamura: *Icones of Japanese Algae*, vol. 1, p. 198, Pl. 40, Fig. 1—6.

Lighthouse rocks, Ponta Abril.

The Inhaca plants agree well with the published descriptions of *Anadyomene wrightii* and with herbarium specimens of this species at the British Museum (Natural History) and Kew.

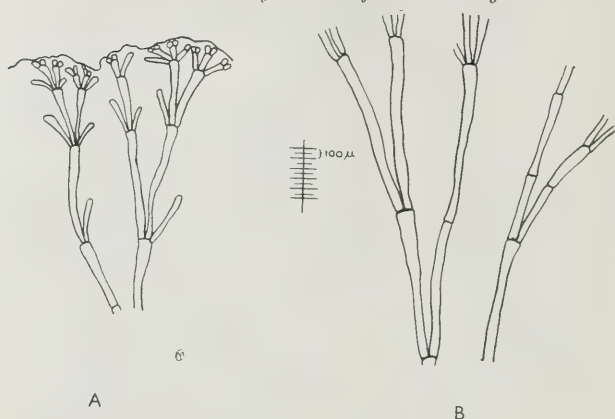


Fig. 7—*Anadyomene wrightii* Gray. (B. 300.)
Diagrammatic representation of "venation", A in upper and B in lower part of frond.

Radiating from the base of the frond may be seen what might be described as veins consisting of linear elongate segments, several times longer than broad. From each of these veins arise radiating cylindrical branches. *A. wrightii* is characterised by the elongation of only some of these (Fig. 7). To quote from Gray's original description: "... joints linear elongate, several times longer than broad, with a radiating group of cylindrical branches at the tip, two to four of which are longer than the rest and proliferate at the tip." This feature is well brought out in the figures and descriptions of both Børgesen and Okamura and is very clearly seen in the Inhaca plants.

J. G. Agardh describes this species as belonging to the "submonostromaticis" group of *Anadyomene*. The Inhaca plants are clearly distromatic (Fig. 8) but as both Børgesen and Okamura also show this plant to be distromatic, the apparent discrepancy with Agardh can be disregarded for the present.

***Dictyosphaeria cavernosa* (Forssk.) Børg.**

Sub-nom *Ulva cavernosa*.

Forsskål: *Flora Aegyptiaco-Arabica*, p. 187.

Sub-nom *Dictyosphaeria favulosa*.

Børgesen: *Marine Algae Danish West Indies*¹. Part 1, p. 33.

Sub-nom *Dictyosphaeria cavernosa*.

Børgesen: *Dansk Bot. Arkiv*. vol. 8, nr. 2, P. 2.

Ponta Abril, Santa Maria.

¹Referred to subsequently as *Marine Algae D.W.I.*



Fig. 1—*Dictyosphaeria cavernosa* (Forssk.) Börg. (B. 322)

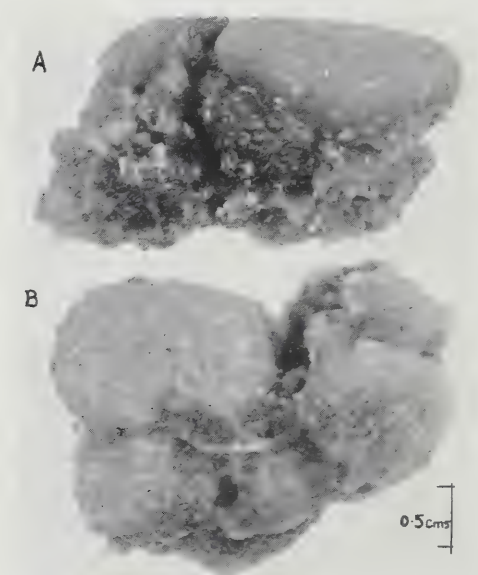


Fig. 2—*Dictyosphaeria versluisii* Weber-van Bosse. A. Side view. B. From above.
(B. 321.)

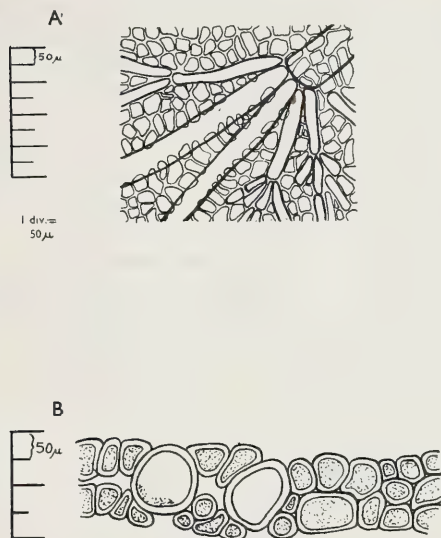


Fig. 8—*Anadyomene wrightii* Gray. (B. 300.)

- A. Portion of frond highly magnified showing cortical cells and the overlapping of the main filaments by them.
B. Transverse section of frond.

The material examined agrees essentially with the published accounts of this species. (Pl. III, Fig. 1).

The "cell" or segment diameter of the Inhaca plants ranges from 300 μ to 1,820 μ and the walls are devoid of spicules.

Dictyosphaeria versluysii Weber-van Bosse.

(Weber van Bosse: *Nuova Notarisia*, vol. 16, p. 142).

Börjesen: *Marine Algae from Mauritius*, 1, p. 13.

Santa Maria, Ponta Abril, West coast beach behind coral reef.

This plant occurs as solid, irregularly lobed globose bodies of from 1—3 cms. in diameter and 1—1.5 cm. thick. They are attached to the substrate by rhizoids. (Pl. III, Fig. 2).

The following three characters have been used in the delimitation of species of *Dictyosphaeria*.

- (1) The general morphology of the plant.
- (2) The diameter of the segments.

- (3) The presence or absence (and size when present) of intra-segmental spines.

B.252, B.268, B.321 from Inhaca most closely resemble *D. versluysii* Weber van Bosse and *D. setchellii* Börg. These species are contrasted by Börgesen (1940, p. 13) as follows:—

	Diameter of "cells"	Spines	
		Length	Breadth at base
<i>D. setchellii</i>	800—1,000—1,500 μ	ca. 70—140 μ	ca. 9—15 μ
<i>D. versluysii</i>	up to 2,000 μ	ca. 130—150 μ	ca. 30 μ

In describing material from Tutuila Island, Setchell describes the spines of *D. versluysii* as being less than 85 μ (Setchell, 1924) and for plants from Revillagigedo Islands the length of spines is given as up to 320 μ (Setchell and Gardner, 1930). Thus spine dimensions do not seem to afford a very reliable character.

The following dimensions were obtained for Inhaca material:—

Diameter of "cells"	Spines	
	Length	Breadth at base
700—2,000 μ	36—138 μ	12—33 μ
with the majority in the		
1,000—1,400 μ range		

It can be seen that the material under consideration overlaps into both *D. setchellii* and *D. versluysii* as defined by Börgesen with perhaps a tendency to closer agreement with *D. setchellii*. Egerod (1952) considers that both these taxa together with *D. van-bosseae* Börg. and *D. australis* Setchell should probably be considered as forms of the one species *D. versluysii* since the differentiation of these taxa from one another is based on size differences of body segments and trabecular spines. Such characters are apt to be very variable and a considerable range has been included by different authors under *D. versluysii*. The intermediate character of B.252, B.268 and B.321 between *D. setchellii* and *D. versluysii* as defined by Börgesen (1940) supports this view.

Egerod recommends that further collections of these forms should be examined before *D. van bosseae*, *D. setchellii* and *D. australis* are sunk in the one species *D. versluysii*. Tentatively, the permanently solid Inhaca plants of *Dictyosphaeria* with intra segmental trabecular spines are included under *D. versluysii*.

Examples were noted of unequally bifurcating spines although most of the spines are straight. The spines are transversely striated, suggesting successive depositions of spine wall material.

Dictyosphaeria versluysii was collected by Dr. Robert J. Rodin (May 1948) at Kosi Bay on the border between the Union of South Africa and

Portuguese East Africa. The record was published by Papenfuss and Egerod together with some account of the Union plants (Papenfuss and Egerod, 1957) but insufficient details are given for comparison with the Inhaca plants. It is pointed out, however, that in the South African plants the intra-segmental spines occur only in the segments towards the base of the plant. In this respect the Kosi Bay specimens present a contrast to the Inhaca plants.

While *D. versluysii* is common on Inhaca Island and on the east coast of the Inhaca Peninsula, it seems to be absent or rare at Xai-Xai, about 80 miles due north of Lourenço Marques.

Siphonocladus tropicus (Crouan) J. Agardh.

Sub-nom *Apjohnia tropica*.

Crouan in Mazé et Schramm., *Alg. Guadel.*, p. 105.

Sub-nom *Siphonocladus tropicus*.

Agardh, J.: *Till Algernes Systematik*, Section 8, p. 105.

Egerod: *Univ. Calif. Publ. Bot.*, vol. 25, No. 5, p. 356, Pl. 30.

Santa Maria.

Although the plants collected are of small size they show the characteristic features of *S. tropicus* (Fig. 9).

There are: (a) multiseriate internal segments,

(b) numerous branches which arise around the entire circumference,

(c) Prominent annular constrictions.

Börgesen (1946, p. 14; 1951, p. 5) records the species from Mauritius and comments on the phyto-geographical interest of the record. It has chiefly been recorded from the Pacific and Atlantic oceans, especially the latter. As far as I am aware this is only the second record for the Indian Ocean.

Struvea anastomosans (Harv.) Piccone.²

Sub-nom *Cladophora anastomosans*.

Harvey: *Phycologia Australica*, vol. 2, Pl. 101.

(Harvey: *Trans. R. I. Acad.*, vol. 22, p. 565).

Sub-nom *Struvea anastomosans*.

(Piccone, A.: *Alghe in D'Albertes, Crociera del Corsaro alle Isole Madera e Canarie*, p. 20).

Egerod: *Univ. Calif. Publ. Bot.*, vol. 25, No. 5, p. 359, Pl. 31.

Sub-nom *Struvea delicatula*.

Kützing: *Tab. Phyc.*, vol. 16, Pl. 2, p. 1.

Lighthouse rocks, Ponta Abril.

² Cited by Egerod (1952) as *Struvea anastomosans* (Harv.) Picc. et Grun. ex Piccone.



Fig. 9—*Siphonocladus tropicus* (Crouan) J. Agardh. (B. 374.)

- A. Young, unbranched filament.
- B. Young filament showing early stages of branching.
- C. Older, branched filament.

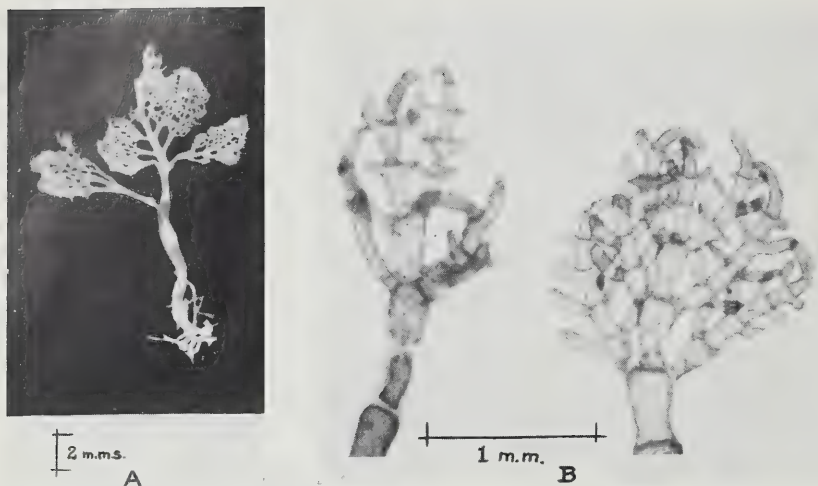


Fig. 1—*Struvea anastomosans* (Harv.) Piccone (B. 297). A. General Habit. B. Portions showing detail.

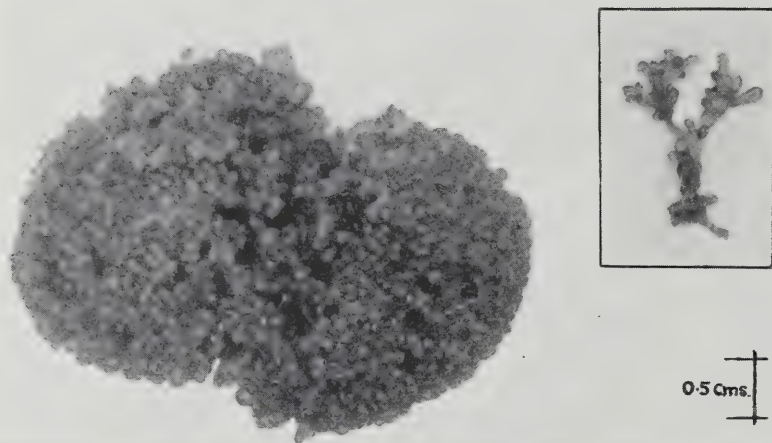


Fig. 2—*Valonia aegagropila* C. Agardh. (B. 296). Inset: A single branched filament.

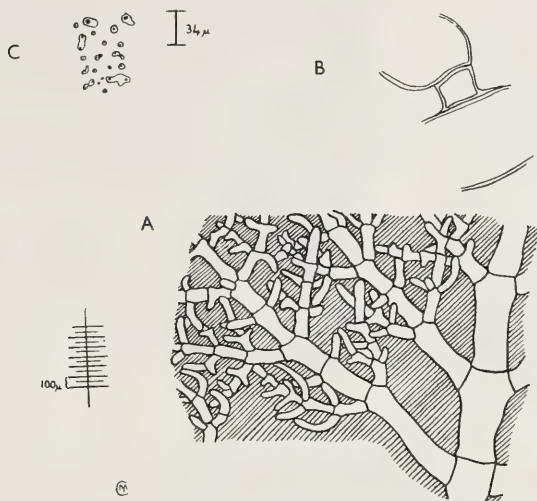


Fig. 10—*Struvea anastomosans* (Harv.) Piccone (B. 297.)

- A. Detail of portion of frond.
- B. Hapteroid anastomosis.
- C. Chloroplasts.

The plants examined were from 1 to 3 cms. tall and had a relatively long stipe arising from a rhizoidal base. The stipe terminates in a frond which is mostly tripinnate and strongly incurved (Plate IV, Fig. 1). The frond segments anastomose frequently showing typical hapteroid connections (Fig. 10). The stipe lacks annular corrugations which *inter alia* demarcates it from other species of *Struvea* (Egerod, 1952).

This species occurs fairly frequently in the Inhaca region in dense mats intimately mixed with many other species such as small corallines and *Ceramium*.

***Valonia aegagropila* C. Agardh.**

Agardh, C. A.: *Species Algarum*, vol. 1, Pt. 2, p. 429.

Egerod: *Univ. Calif. Publ. Bot.*, vol. 25, No. 5, p. 348, Plate 29 B.

Taylor: *Plants of Bikini*, p. 41.

On west coast of Saco ("Scolopendrina Cove").

The plants of this species occur as more or less compact balls of radiating sub-clavate filaments (Plate IV, Fig. 2). The filaments are branched, the branches forming coenocytic segments (Fig. 11).

The young balls are compact and solid but the filaments tend to fall



Fig. 11—*Valonia aegagropila* C. Agardh.
Isolated filament from a young ball.

apart from one another to a greater or lesser extent in the older balls. Balls of up to 6 cm. diameter and about 2.5 cms. high were examined.

The segments of the plant are turgid but collapse if pricked. The chloroplasts form a layer under the plant wall.

In older specimens the early development of branches is clearly seen to be the same as described by Börgesen for *Valoniopsis*, with first a dark area appearing on the wall of a segment which grows to form a dark pimple-like structures (Börgesen, 1934.). Thereafter elongation occurs with the contents becoming concurrently lighter in colour. The type of branching, however, is unlike that of *Valoniopsis* (Börgesen, 1934; Isaac, 1957).

The plants occur abundantly among the lower parts of *Cymodocea rotundata* and *C. serrulata*. Brittle stars (*Ophiocoma scolopendrina* and especially *Ophiactis savignyi*) are abundant among the branches of *Valonia aegagropila*.³

Levring recorded *Valonia aegagropila* for the coast of Natal, at Durban (Levring, 1938). Subsequently Silva (1951) showed that the material identified by Levring as *Valonia aegagropila* is a new species of *Codium* (*C. megalophysum* Silva) with very large utricles. It is thus uncertain whether *Valonia aegagropila* occurs on South African coasts.

³ Thanks are due to Dr. Margaret Kalk for this information (see also, Balinsky 1957).

Valoniopsis pachynema (Mart.) Börg.

See Isaac, "Xai-Xai Algae", P.85.

Santa Maria, Ponta Abril, Lighthouse Rocks.

Plants of this species were collected by Papenfuss and Pocock near St. Lucia Bay on the northern Natal coast in July 1938 (Papenfuss and Egerod, 1957). Only a few fragmentary specimens were available and thus no detailed account was possible.

DASYCLADALES

Acetabularia mobii⁴ Solms.

Solms-Laubach: *Monograph of the Acetabularieae*, p. 30, Plate 4,
Fig. 1.

Börgesen: *Marine Algae from Mauritius*, 1950, p. 6, Fig. 1.

Egerod: *Univ. Calif. Publ. Bot.*, vol. 25, No. 5, p. 411.

Ponta Abril.

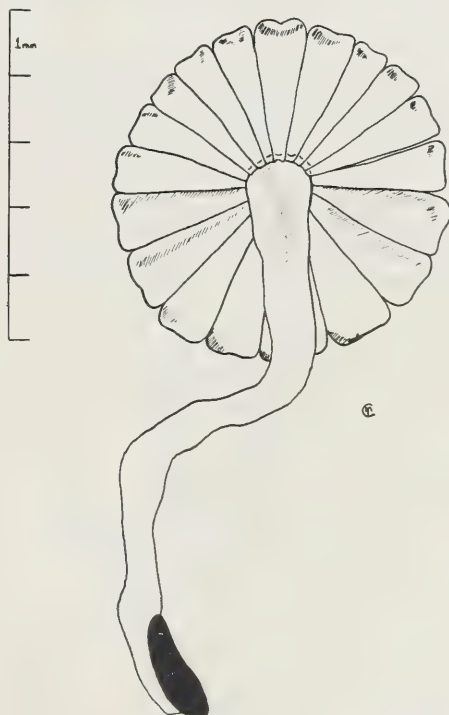


Fig. 12—*Acetabularia mobii* Solms. (B. 311.)

⁴ Rendered *A. moebii* in Börgesen *Mauritius Algae* (1940, p. 44; 1951, p. 6).

Only two specimens collected, one of which is in the Botany Department Cape Town University (B.311) and the other in the British Museum (Natural History).

The plants collected are sterile.

The Inhaca material has nineteen more or less closely adherent rays, the apices of which are emarginate (Fig. 12). There is no corona inferior. The coronal knobs of the corona superior are 112μ long and 95μ wide and bear five hair scars in a ring. The disc is about 5 mm. in diameter and the weak stalk is about 9 mm. long.

The plants collected differ from Solms-Laubach's original description in having more than "about 15" rays and in that the rays have emarginate apices. Börgesen (1951) subsequently described specimens from Mauritius with 17 rays and with some of the rays having emarginate apices. Egerod (1952) gives the number of rays for Hawaiian plants as 14–20.

The Inhaca plants are larger than those described by Börgesen from Mauritius and by Eubank for Hawaii.

A. mobii was collected near Kosi Bay (May 1948) by Dr. Robert J. Rodin and by Dr. Mary A. Pocock (October 1951) at Hibberdene on the South Natal coast (Papenfuss and Egerod, 1957). This species would seem to be of similar dimensions both on the east coast of the Union and at Inhaca.

Dasycladus ramosus Y. Chamberlain.

See paper by Chamberlain (1958).

This species is widely distributed on both Inhaca Island and Peninsula. It is a prominent rock pool species.

PHAEOPHYTA

ECTOCARPALES

Ectocarpus irregularis Kütz.

Kützling: *Phycologia Germanica*, p. 234.

Tab. Phyc., vol. 5, p. 19, pl. 62, fig. 1.

Börgesen: *Marine Algae from the Canary Islands*, Pt. 2, p. 25.

Börgesen: *Mauritius Algae*, Pt. 2, p. 23.

On sand at about mid tide level, west coast of Inhaca Island.

Inhaca plants of B.242 come within the range of variation of the polymorphic species *Ectocarpus irregularis* as conceived by Börgesen (1941) especially as the comprehensively conceived species includes the former species *E. coniferus* Börg., described as a new species from the Danish West Indies (Börgesen, 1914).

The Inhaca material is irregularly and profusely branched. The cells of the main filaments are up to 30μ broad and except in meristematic regions one to two times as long as broad. The filaments are somewhat narrower at the base. The filaments taper out at their upper ends into long thin cells about 10μ broad and up to 100μ or so long. Meristematic regions occur throughout.

In the lower cells, the chromoplast is an irregular net-like structure. There are one or more dense chromoplasts in the long cells of the main axes.

No unilocular sporangia were observed but the material examined bore numerous plurilocular sporangia. These structures arise singly or in short series on the upper (adaxial) side of the branches. The latter condition recalls that figured for West Indian material described under the name of *E. coniferus* except that the West Indian material bore longer

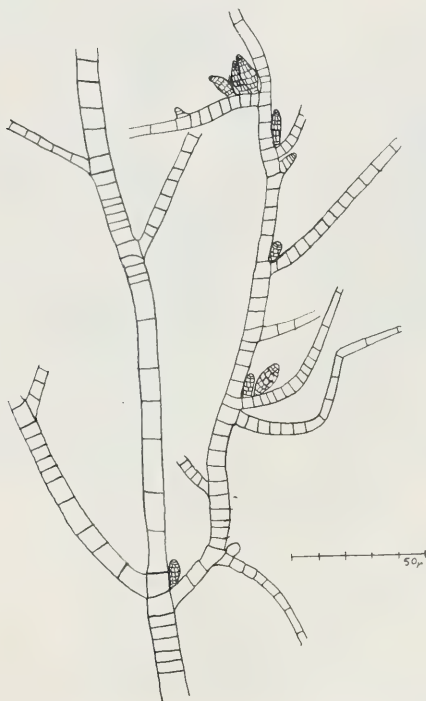


Fig. 13—*Ectocarpus irregularis* Kütz.

series of plurilocular sporangia (Börgesen, 1914, p. 9). Börgesen (1941) pointed out that subsequently Sauvageau (1933) described forms of *E. irregularis* with short rows of sporangia at the base of branches. A single sporangium or the first sporangium of a row, arises on the basal or first cell of a branch (Fig. 13). Sporangia also occur on the main filaments.

The sporangia are usually sessile but occasionally have a short stalk. In form they are ovate-lanceolate and taper upwards. Measurements are given below of what seemed to be fairly mature plurilocular sporangia.

Width at widest part	Length
30.6 μ	68.0 μ
37.4 μ	95.2 μ
27.2 μ	74.8 μ
30.6 μ	85.0 μ
30.6 μ	81.6 μ

DICTYOTALES

Dictyota pardalis Kütz.

Kützinger: *Tab. Phyc.*, vol. 9, p. 16, Pl. 39, fig. 2.

Vickers: *Phyc. Barbadosensis*, Part 2, plate 21.

Ponta Rasa.

The three species *D. volubilis* Kütz., *D. bartayresiana* Lamour. and *D. pardalis* are not well delimited from one another. This is especially true of the two latter species and it has been suggested (Weber van Bosse, 1913, p. 182) that *D. pardalis* is a form of the variable *D. bartayresiana*. Clearly this group of forms needs further critical study and the identification of ISAAC 543 as *D. pardalis* is to be regarded as tentative.

Material B289 and ISAAC 543 although rather more twisted than Vicker's delineation of *D. pardalis*, is less twisted than *D. volubilis* is reported to be. Also the more irregularly dichotomous branching agrees better with *D. pardalis*.

The plant was found growing on sandbanks in sheltered situations. In this locality it also occurs as an epiphyte on *Cymodocea ciliata*.

FUCALES

Cystoseira myrica (Gmelin) J.Ag.

Sub nom *Fucus myrica*.

Gmelin: *Hist. Fucorum*, p. 88, Plate 3, Fig. 1.

Sub nom *Phyllacantha myrica*

Kützinger: *Tab. Phyc.*, vol. 10, p. 14, Pl. 37.

Sub nom *Cystoseira myrica*

Agardh, J. G.: *Species, Genera et Ordines Algarum*, vol. 1, p. 222.

Ponta Abril, Lighthouse rocks.

Material of this species from Inhaca was identified by J. Feldmann to whom we are grateful both for his identification and for his comments. Reference to this species at Xai-Xai was made in a previous paper (Isaac, 1957).

C. myrica is very widely distributed: in the east African region broadly interpreted, it occurs in the Red Sea, the Persian Gulf, Madagascar,



Fig. 14—A form of *Cystoseira myrica* (Gmelin) J. Ag. (B. 267.)

Mauritius and Réunion. In view of this distribution the new records of this species at Xai-Xai and Inhaca are not, as Feldmann remarks, surprising.

More luxuriant sterile material (B.463) of this species but without bladders was collected by Dr. Margaret Kalk in November on the Island of Moçambique which is at about 15°S. latitude. It has also been recorded for the Kenya coast but without information regarding the morphological characteristics of the plants (Lind, 1956).

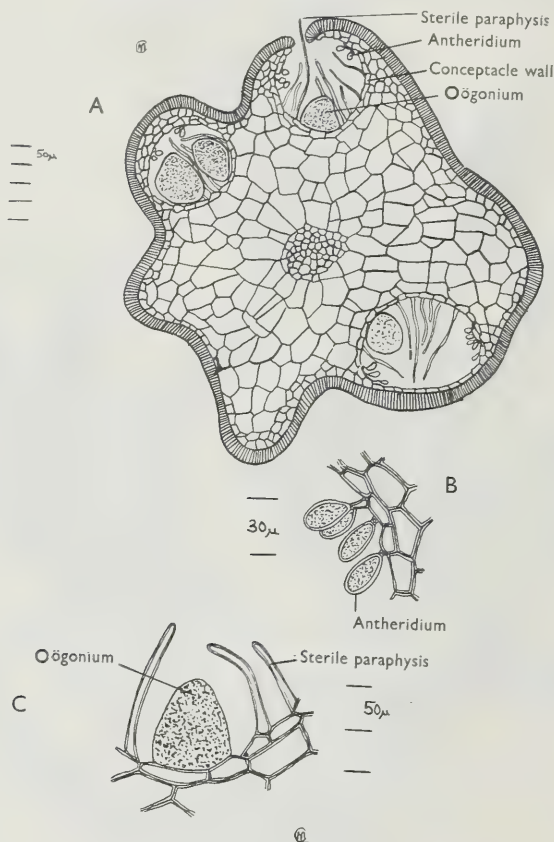


Fig. 15—*Cystoseira myrica* (Gmelin) J. Ag. (B. 267.)

A. Transverse section of receptacle.

B. Antheridia.

C. Oogonium.

Red Sea plants often have bladders (aerocysts) whereas the specimens collected at Inhaca and Xai-Xai are stunted and without bladders (Fig. 14), in which respect the Portuguese East African material examined agrees with specimens from Madagascar, Mauritius and Réunion. The Réunion material was recorded as *Polycladia commersonii* Montagne but Feldmann (private communication) is satisfied that Montagne's specimens correspond perfectly with *Cystoseira myrica*. Feldmann considers that the absence of bladders is not a sufficient basis for delimiting the plants grouped under this species into two distinct species.

Fertile plants with distinctive, clustered receptacles were collected. The conceptacles are hermaphrodite, the oogonia occupying the base and the antheridia the sides of the conceptacle (Fig. 15). The oogonia each contain one ovum; as the basal cell is embedded in the conceptacle wall it is not evident. The antheridia arise singly each having a basal cell.

It occurs at low intertidal levels and in pools.

Sargassum elegans Suhr.

See "Xai-Xai Algae", p. 91.

Lighthouse rocks, Ponta Abril, Santa Maria.

In places (e.g., Lighthouse rocks) at low intertidal levels the rocks are dominated by this alga.

Sargassum heterophyllum (Turn) C.Ag.

See "Xai-Xai Algae", p. 92.

Santa Maria.

FLORIDEAE

NEMALIONALES

Liagora ceranoides Lamouroux var. *leprosa* (J. Agardh) Yamada.

(Lamouroux: *Hist. polyp. corallig. flex.*, p. 239).

Yamada: *Liagora from Japan*, p. 20, Pl. 6.

On west coast of Inhaca to the north of the Estação de Biologia Marítima

The taxon *L. ceranoides* as understood by Yamada includes *L. pulverulenta* of C. A. Agardh (*Spec. Algar.*, vol. 1, p. 396) and *L. leprosa* of J. G. Agardh (*Alg. Liebm*, 1847, p. 8). Fuller references will be found in Yamada's paper. Yamada points out in his monograph that plants assigned by earlier authors to *L. pulverulenta* were almost always characterised by the presence of numerous short ramuli arising at about right angles to the axes bearing them while plants assigned to *L. leprosa* lack such branches and are usually pale in colour. On the basis of these characters he distinguishes two varieties of *L. ceranoides*—var. *pulverulenta* (Agardh) Yamada and var. *leprosa* (J. Agardh) Yamada.

The material of *L. ceranoides* here dealt with corresponds to var. *leprosa* since it is pale in colour and ramuli or proliferations are very rare.

This plant was found growing attached to stones scattered over a sandy beach. When the tide is out the plants collapse into white or very pale pink untidy masses of fine branches which masses are somewhat soapy to the touch. On close examination the tips of the branches are seen to have a deeper pink or reddish colour. When spread out (Plate V) the repeated dichotomous branching of the plant can be seen, the branching being much denser at the distal end.

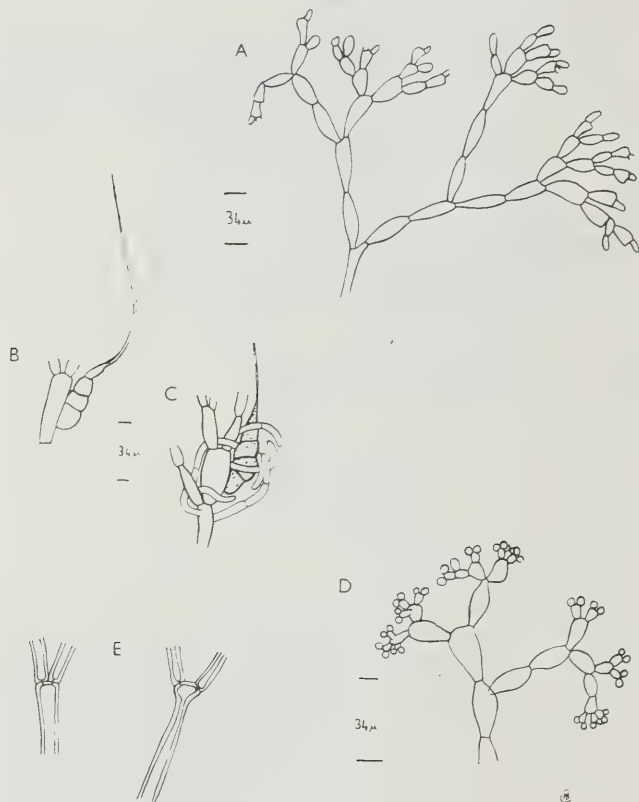
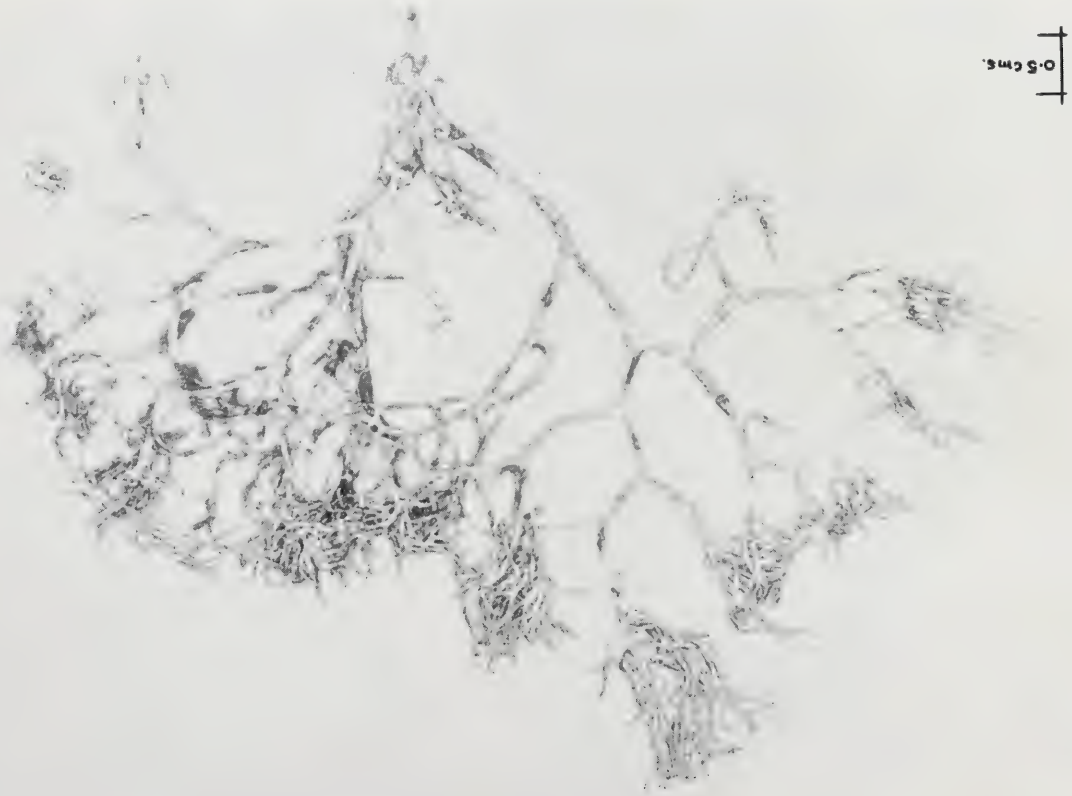


Fig. 16—*Liagora ceranoides* Lamouroux var. *leprosa* (J. Agardh) Yamada.

- A. Assimilating filaments.
- B. Carpogonial branch.
- C. Enveloping threads developing around carpogonial branch.
- D. Antheridia.
- E. Joints of central filaments.

0.5 cms.



Lingoria cernuoides Lamouroux var. *leprosa* (J. Agardh.) Yamada. (Isaac 658.)

PLATE V.



Fig. 1—*Liagora valida* Harv. (B. 286).



Fig. 2—*Laurencia obtusa* (Huds.) Lam. var. *rigidula* Grunow. (Isaac 801).

The material collected is fertile. Structural characters of the antheridial and carpogonial branches as well as some vegetative features are illustrated in Fig. 16.

***Liagora valida* Harv.**

Harvey: *Nereis Bor. Am.*, Pt. 2, p. 138, Pl. 31A.

Börgeesen: *Marine Algae D.W.I.*, Pt. 3 (1), p. 70.

Börgeesen: *Mauritius Marine Algae*, Additions, 1949, p. 26.

Lighthouse rocks, Ponta Abril.

The plants are about 6 cm. high, erect and rigid, due to marked incrustation of lime. They are repeatedly branched. The width of the branches varies but little throughout, being about 1—1.5 mm. in the upper parts and 1.5—2.0 mm. at the base (Pl. VI Fig. 1). The tips of the branches are red, but below, the plant is white with a rosy tinge. In the upper parts the chalky incrustation has numerous fine uncalcified areas which mark the position of projecting filaments. The calcified layer of the lower parts is thick but often cracked.

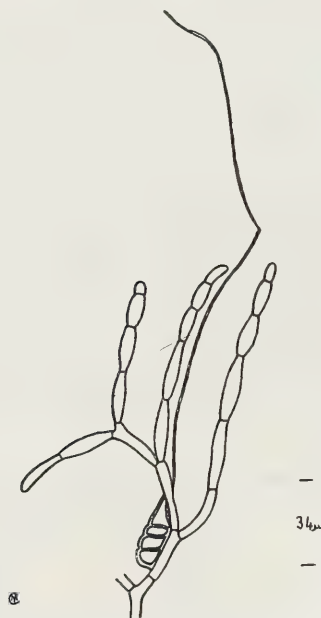


Fig. 17—Carpogonial branch of *Liagora valida* Harv.

In structure the plant consists of numerous central filaments which are $20-30\mu$ wide with thick walls. From these central filaments dichotomously branched assimilatory filaments arise which are $160-170\mu$ long in the upper parts of the plant. In the upper parts, the cells of these assimilatory filaments are fairly long and narrow but are more barrel shaped in the lower parts.

In the parts examined only female reproductive organs were found. The carpogonia are situated laterally on the lower cells of the assimilatory filaments and consist of three to five cells. They are more or less curved and have a very long trichogyne, about twice the length of the assimilatory filaments (Fig. 17). Enveloping threads grow around the developing carpoogonium which has a diameter of about 130μ .

CRYPTONEMIALES (Corallinaceae)

Cheilosporum cultratum (Harv.) Aresch.

See "Xai-Xai Algae", p. 93.

Lighthouse rocks.

Corallina cubensis (Mont.) Kütz. emend Börg.

Sub nom *Jania cubensis*.

(Montagne: *Sylloge gen. specierumque Cryptogamarum*, p. 429).

Kützling: *Species Algarum*, p. 709.

Sub nom *Corallina cubensis*.

Kützling: *Tab. Phycol.*, vol. 8, p. 37, Pl. 77, Fig. 2.

Börgesen: *Marine Algae D.W.I.*, Pt. 3 (3), p. 187.

Ponta Rasa.

Specimens B.394 agree in all respects with Börgesen's lucid description of an old and badly described species of Montagne which did in fact turn out to be based on a mixture of two different genera. One of the authors (Miss Yvonne Chamberlain) compared the Inhaca material with Börgesen's specimens from St. Jan in both the British Museum and Kew Herbaria and found the correspondence to be exact in size as well as all other characteristics. Börgesen's material was found growing on rocks and corals whereas the Inhaca plants were epiphytic on *Cymodocea*. Several of the British Museum specimens, however, were epiphytic on such plants as *Digenea simplex*.

As described by Börgesen, the plant branches very irregularly and the untidy appearance is accentuated by unequal development of the branches, some of which are very slender (Fig. 18). The specimens collected at Inhaca in July appear to be sterile.

In the British Museum Herbarium there are specimens of this species from the following localities: Jamaica, Cuba, Florida, St. Jan, Mexico, St. Vincent, Fernando de Noronha, Guadeloupe, Antilles, Bahamas. The



Fig. 18—*Corallina cubensis* (Mont.) Kütz. emend Börg. (B. 394.)

Inhaca record thus affords a considerable and interesting extension of the geographic range of *Corallina cubensis*.

***Jania intermedia* Kütz.**

See "Xai-Xai Algae", p. 93.

Lighthouse rocks, Ponta Abril.

GIGARTINALES

***Catanelia opuntia* (Goodenough et Woodward) Greville.**

Sub nom *Fucus opuntia*.

Goodenough and Woodward: *Linn. Trans. III*, p. 219.

Sub nom *Catanelia opuntia*.

Greville: *Algae Britannicae*, p. 166, Pl. 17.

Börgeesen: *Marine Algae D.W.I.*, Pt. 4 (5), p. 359, Fig. 354.

Saco, Ponta Punduini.

This plant (Fig. 19) forms dense mats with *Bostrychia* on *Rhizophora* roots. It also occurs, again often with *Bostrychia*, at high intertidal levels in shady places under rock overhangs.

***Gracilaria crassa* Harv. forma *conglomerata* Börg.**

Börgeesen: *Mauritius Marine Algae*, Additions 4, p. 34.

Lighthouse rocks.

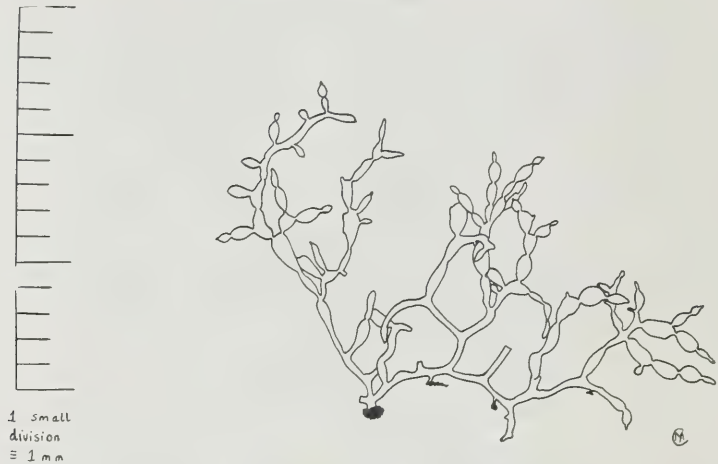


Fig. 19—*Catanella opuntia* (Goodenough et Woodward) Greville. (B. 387.)

After careful consideration and deliberation Börgesen (*Mauritius Algae*: 1943, 1950, 1951, 1952) came to the conclusion that plants named *Corallopsis opuntia* and *Gracilaria crassa* belonged to one species and he agreed with Linda Newton (letter) that the species should be named *Gracilaria crassa* (Börgesen, 1952, p. 33). Of this species he described and illustrated the new form, *conglomerata* from Mauritius. *Forma conglomerata* was collected at Inhaca (B.387; Fig. 20).

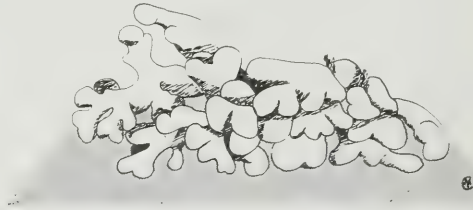


Fig. 20—*Gracilaria crassa* Harv. forma *conglomerata* Börg. (B. 381.) Natural size.

The upright form of the species was recorded in Marine Algae of Inhaca under the name of *Corallopsis opuntia* J.Ag.

***Hypnea rosea* Papenfuss.**

See "Xai-Xai Algae", p. 98.

Lighthouse rocks (epiphytic on *Cymodocea ciliata*).

CERAMIALES

Acanthophora muscoides (L.) Bory.

Sub nom *Fucus muscoides*.

Linnaeus: *Species Plantarum* 2, p. 1161.

Sub nom *Acanthophora muscoides*.

(Bory in Duperry: *Voyage autour du Monde sur la Coquille*, p. 156.)

Sand flats to north of marine station, west coast of Inhaca; Ponta
Abril; Lighthouse rocks; "Saco"; Ponta Rasa.

Inhaca material of this species is illustrated in Figs. 21 and 22.
Although the number of described species of *Acanthophora* is relatively
small, the descriptions are very often so inadequate that the taxonomy is
in considerable confusion. It seems that most of the species have been
described from dried material. This is unsatisfactory. Dried Inhaca

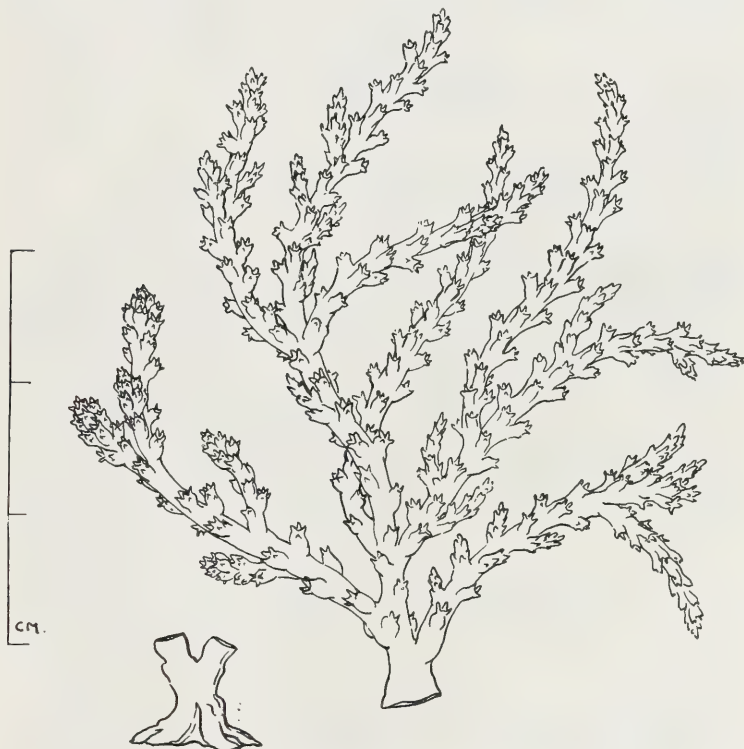


Fig. 21—*Acanthophora muscoides* (L.) Bory. (B. 367.)

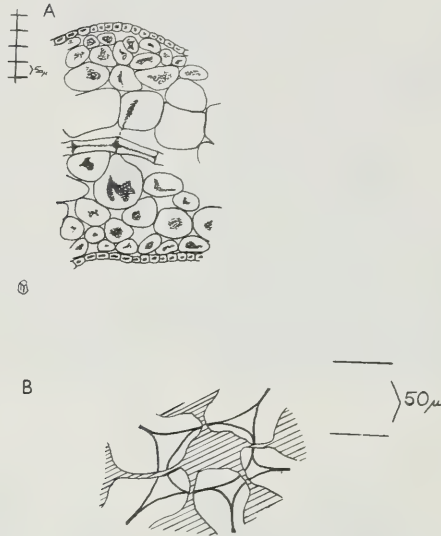


Fig. 22—*Acanthophora muscoides* (L.) Bory.
A. Longitudinal section showing central filament.
B. Central filament in transverse section. Semi-diagrammatic.

plants when soaked out do not become restored to the size of preserved *Inhaca* material and the general form seems somewhat changed also.

The species greatly resemble one another in vegetative morphology and cannot satisfactorily be identified in the vegetative state. Fortunately *Inhaca* material B.367 is cystocarpic.

According to de Toni (1903, p. 818) the genus is divided into two groups: one group in which plants bear spines on the main axis and a second group in which the spines occur on side branchlets. Plants of B.367 have spines on the main axis but they are rare except in the youngest parts from which it might be inferred that most of them subsequently develop into branchlets. What seem to be stages in such a development can be observed. The few spines on the older parts of the main axis indicate that the plant belongs to the *muscoides*, *delilei*, *dendroides* group.

The cystocarps are sub-globose with wide terminal openings when ripe (Fig. 23). They occur on the side branchlets—sometimes terminally, sometimes laterally. Nearly all species of *Acanthophora* have urn-shaped cystocarps and indeed no description of an *Acanthophora* with sub-globose cystocarps has been found. In Kützing's *Tabulae Phycologicae* (vol. 15, p. 27, Pl. 76), there is a drawing of *Acanthophora ramulosa* (Lind.) Kütz.



Fig. 23—Branchlet and cystocarps of *Acanthophora muscoides* (L.) Bory. M, main axis.

which has sub-globose cystocarps. The plant on which this drawing is based was found by Lindenberg on the coast of Angola and is probably the same taxon as that of Inhaca. *A. ramulosa* was sunk by de Toni (1903, p. 818) in *A. muscoides*.

The general form of the plant agrees quite well with W. R. Taylor's figures (Taylor, 1928, p. 165, Pl. 26, Fig. 7; Pl. 34, Fig. 9) but not so well with those of Okamura (1907, p. 38, Pl. 8). The following were consulted by one of us (Chamberlain) but were not found helpful: Lamouroux's *Essai*, Howe in Britton and Millspaugh's *Bahama Flora* and Harvey in *Nereis Boreali Americana* (Part 2, p. 18, 1853) sub nom. *A. delilei*.

A comparison of the Inhaca material was made with specimens of *A. muscoides* in the British Museum Herbarium and the Inhaca material was found to bear a close resemblance to a specimen of Børgesen's from Mauritius which does not seem to have been dealt with in Børgesen's monograph on Mauritius Marine Algae. Børgesen does, however, describe *A. muscoides* from the Danish West Indies and describes the cystocarps as being ovate—urnshaped (Børgesen, 1918).

To sum up. The Inhaca material of this plant (B.367) is named *Acanthophora muscoides* (L.) Bory because the general appearance of the plant agrees quite well with this species and because of the resemblance of the cystocarps to those of *A. ramulosa* (Lind.) Kütz. which has been sunk in this species.

It is recognised that further work on the genus *Acanthophora* might well result in *A. ramulosa* being re-instated to specific rank.

Centroceras clavulatum (Ag.) Mont.

Agardh, J.: *Species Genera et Ordines Algarum* vol. 2, Pt. 1, p. 148;
Epicrasis, p. 108.

(Montagne: *Exploration scientifique de l'Algeria, Algues*, vol. 1, p. 140).
Santa Maria.

Laurencia natalensis: Kylin.

Kylin: *Rhodophyceen von Südafrika*, p. 24, Pl. 8, Fig. 21.
 Ponta Abril, Santa Maria, Lighthouse rocks.

This species is prominent in a living condition due to its bright reddish short globose branches.

Börgesen does not regard this taxon as being of specific rank but styles it *Laurencia obtusa* (Huds.) Lamour. var. *natalensis* (Kylin) Börg. (see Börgesen, 1945, p. 59).

This species is mostly found on rocky substrata somewhat above the lowest intertidal levels.

Laurencia natalensis is widely distributed on the east coast of the Union and extends westwards along the south coast.

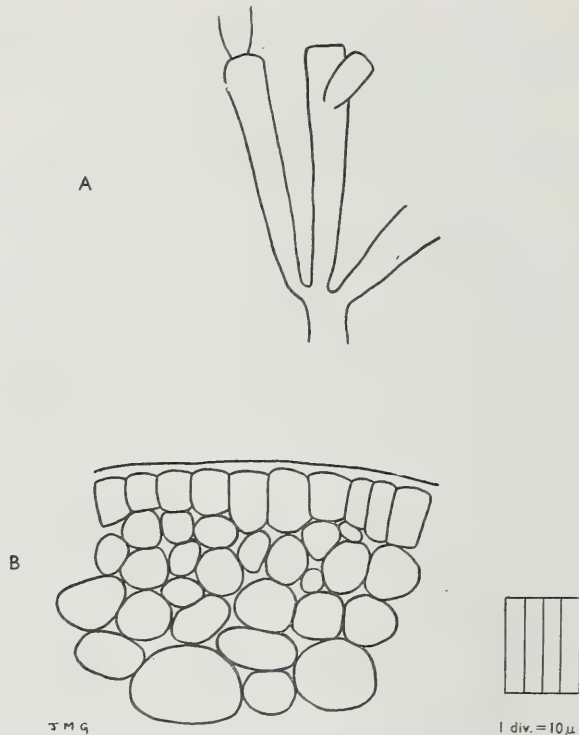


Fig. 24—*Laurencia obtusa* (Huds.) Lam. var. *rigidula* Grunow.
 A. Showing increase in diameter from base upwards of branches.
 B. Transverse section.

Laurencia obtusa (Huds.) Lamour var. *rigidula* Grunow.

Grunow: *Jour. Mus. Godeffroy*, vol. 6, p. 45.

Börgeesen: *Marine Algae of Mauritius III*, Pt. 4, p. 58.

Ponta Abril, Santa Maria, Lighthouse rocks.

The material collected (Pl. VI, Fig. 2) is up to about 4 cm. high although mostly it does not exceed about 3 cms. It is of a dark red or very dark greenish colour and mostly occurs in dense clumps of rigid fronds. The branches arising from the main axes are short and show a characteristic gradual increase in diameter from the base upwards (Fig. 24A). In transverse section (Fig. 24B) the absence of a clear palisade-like epidermis is to be noted. The inner cells vary greatly in size but there is, in contrast to what was observed by Börgeesen for Mauritius plants (1945, Fig. 35), a tendency for cell size to increase inwards. As with Börgeesen's material the largest cells noted have a diameter of about 50μ and there are no particular thickenings.

Laurencia pumila (Grun.) Papenfuss.

Sub nom *Laurencia flexuosa* Kütz. var. *pumila* Grun.

Grunow: *Novara—Algen*, p. 87.

Sub nom *L. pumila*.

Papenfuss: *Jour. S. Afr. Bot.*, vol. 9, p. 91.

Santa Maria, Ponta Abril, Lighthouse rocks.

Inhaca plants of this species agree well with Tyson material so named by Papenfuss in the Herbarium of the British Museum of Natural History. The British Museum material, however, consists of somewhat larger plants collected at Durban.

Tetrasporic plants were collected in July at both Ponta Abril and the Lighthouse rocks.

Superficially the Inhaca plants resemble *Laurencia subcolumnaris* Börgs from Mauritius. The anatomy of the species, however, is different since the Inhaca plants lack the two outer rows of very small cells found in *L. subcolumnaris* (Börgeesen, 1954).

This species is common or very common at lower mid tide levels. It is widely distributed in the east coast of the Union.

ACKNOWLEDGEMENTS

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Fig. 14 was drawn by Miss Fay Anderson, Fig. 5 and 6 by Mrs. S. M. Simons and Fig. 24 by Miss J. M. Graves to whom we offer our thanks.

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Lastly particular thanks are due to Dr. Margaret Kalk for her co-operation at Inhaca.

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